

PATENT

**WHAT IS CLAIMED IS:**

1. An apparatus for recovering a symbol clock signal from an American Television Standards Committee (ATSC) digital television (DTV) signal, the apparatus comprising:

5 a downconverter adapted to coherently downconvert the ATSC DTV signal to a baseband signal;

a delay unit adapted to delay the baseband signal;

a multiplier adapted to multiply the baseband signal and the delayed baseband signal;

a band-pass filter adapted to pass a frequency component of the symbol clock signal;

10 and

a phase-locked loop to generate the symbol clock signal based on an output of the band-pass filter.

2. The apparatus of claim 1, further comprising:

15 a receiver adapted to receive the ATSC DTV signal.

3. The apparatus of claim 1, wherein the ATSC DTV signal comprises a pilot signal, and wherein the downconverter comprises:

a filter adapted to pass the pilot signal; and

20 a mixer adapted to mix the pilot signal and the ATSC DTV signal.

4. The apparatus of claim 1:

wherein the delay unit is adapted to delay the baseband signal by one-half of a chip.

25 5. The apparatus of claim 1, further comprising:

an analysis unit adapted to determine for the symbol clock signal at least one of the clock frequency;

the clock phase;

the clock offset;

30 the Allan variance; and

the clock stability.



## PATENT

6. An apparatus for recovering a symbol clock signal from an American Television Standards Committee (ATSC) digital television (DTV) signal, the apparatus comprising:

5 downconverter means for coherently downconverting the ATSC DTV signal to a baseband signal;

delay means for delaying the baseband signal;

multiplier means for multiplying the baseband signal and the delayed baseband signal;

10 band-pass filter means for passing a frequency component of the symbol clock signal; and

phase-locked loop means for generating the symbol clock signal based on an output of the band-pass filter.

15 7. The apparatus of claim 6, further comprising:

receiver means for receiving the ATSC DTV signal.

8. The apparatus of claim 6, wherein the ATSC DTV signal comprises a pilot signal, and wherein the downconverter means comprises:

20 filter means for passing the pilot signal; and

mixer means for mixing the pilot signal and the ATSC DTV signal.

9. The apparatus of claim 6:

25 wherein the delay means is further for delaying the baseband signal by one-half of a chip.

10. The apparatus of claim 6, further comprising:

analysis means for determining for the symbol clock signal at least one of

the clock frequency;

30 the clock phase;

the clock offset;



the Allan variance; and  
the clock stability.

11. A method for recovering a symbol clock signal from an American Television  
5 Standards Committee (ATSC) digital television (DTV) signal, the method comprising:  
coherently downconverting the ATSC DTV signal to a baseband signal;  
delaying the baseband signal;  
multiplying the baseband signal and the delayed baseband signal;  
band-pass filtering the symbol clock signal; and  
10 generating the symbol clock signal based on the filtered baseband signal.

12. The method of claim 11, further comprising:  
receiving the ATSC DTV signal.

13. The method of claim 11, wherein the ATSC DTV signal comprises a pilot  
15 signal, and wherein downconverting comprises:  
mixing the pilot signal and the ATSC DTV signal.

14. The method of claim 11, wherein delaying comprises:  
20 delaying the baseband signal by one-half of a chip.

15. The method of claim 11, further comprising:  
determining for the symbol clock signal at least one of  
the clock frequency;  
25 the clock phase;  
the clock offset;  
the Allan variance; and  
the clock stability.



PATENT

16. Computer-readable media embodying instructions executable by a computer to perform a method for recovering a symbol clock signal from an American Television Standards Committee (ATSC) digital television (DTV) signal, the method comprising::

coherently downconverting the ATSC DTV signal to a baseband signal;  
5       delaying the baseband signal;  
multiplying the baseband signal and the delayed baseband signal;  
band-pass filtering the symbol clock signal; and  
generating the symbol clock signal based on the filtered baseband signal.

10       17. The media of claim 16, wherein the method further comprises:  
receiving the ATSC DTV signal.

18. The media of claim 16, wherein the ATSC DTV signal comprises a pilot  
signal, and wherein downconverting comprises:  
15       mixing the pilot signal and the ATSC DTV signal.

19. The media of claim 16, wherein delaying comprises:  
delaying the baseband signal by one-half of a chip.

20       20. The method of claim 16, wherein the method further comprises:  
determining for the symbol clock signal at least one of  
the clock frequency;  
the clock phase;  
the clock offset;  
25       the Allan variance; and  
the clock stability.